

OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **BEAVER LAKE** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a, also a measure of algal abundance, in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stable* in-lake chlorophyll-a trend. There was a peak in the chlorophyll-a concentration in July, which correlates with a peak in the epilimnetic (upper water layer) phosphorus concentration during July. The average chlorophyll-a concentration this summer was below the state mean. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.
- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *stable* trend in lake transparency. In July, the clarity was not overly affected by the increased chlorophyll concentrations. The overall water clarity this season increased slightly and was back above the NH mean reference line. This season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.
- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth

over time. These graphs show a *slightly improving* trend for in-lake phosphorus levels, which means concentrations are decreasing. The phosphorus concentrations in both the upper and lower water layer increased slightly this season, most likely as a result of the increase in summer rainfall. The highest epilimnetic phosphorus concentration occurred in July; the samples were taken the day after a rainstorm, which indicates nutrients were washed into the upper layer of the lake from the surrounding watershed. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- In-lake and tributary conductivity levels were reduced from last year's results (Table 6), reaffirming our thoughts that the low flow and dry conditions caused the increases in 1999. We are glad the conductivity returned to its normal level throughout the watershed. Cat-O-Brook and Jenny-Dickey Brook continue to have the highest conductivity levels of the tributaries feeding Beaver Lake.
- The tributaries to Beaver Lake experienced lower total phosphorus concentrations this year (Table 8) versus last year's results. Again, the dry conditions and low flow situations observed last year were likely the cause of the higher nutrient concentrations. Even though New Hampshire had more rainfall this year than last the concentrations were back to their normal levels. This is a good sign because had there been external sources of nutrients in the watershed they would have appeared this year as higher concentrations of phosphorus in the tributaries.
- Again this year, dissolved oxygen concentrations were very low at the bottom meter in the lake (Table 10). The process of decomposition in the sediments depletes dissolved oxygen on the bottom of the lake. As bacteria break down organic matter, they deplete oxygen in the water. When oxygen gets below 1 mg/L, phosphorus normally bound up in the sediment may be released into the water column, a process that is referred to as *internal loading*. Depleted oxygen in the hypolimnion usually occurs as the summer progresses.

NOTES

- Monitor's Note (5/30/00): All tributaries flowing freely. Cat-O-Brook bottle labeled as Manter.
- Monitor's Note (6/21/00): Tributary flow fast.

- Monitor's Note (7/26/00): Moderate rain night before samples. Sun in morning of samples; overcast, light rain when taking samples.

USEFUL RESOURCES

Low Impact Boating, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Handle With Care: Your Guide to Preventing Water Pollution. Terrene Institute, 1991. (703) 661-1582.

What is a Watershed?, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

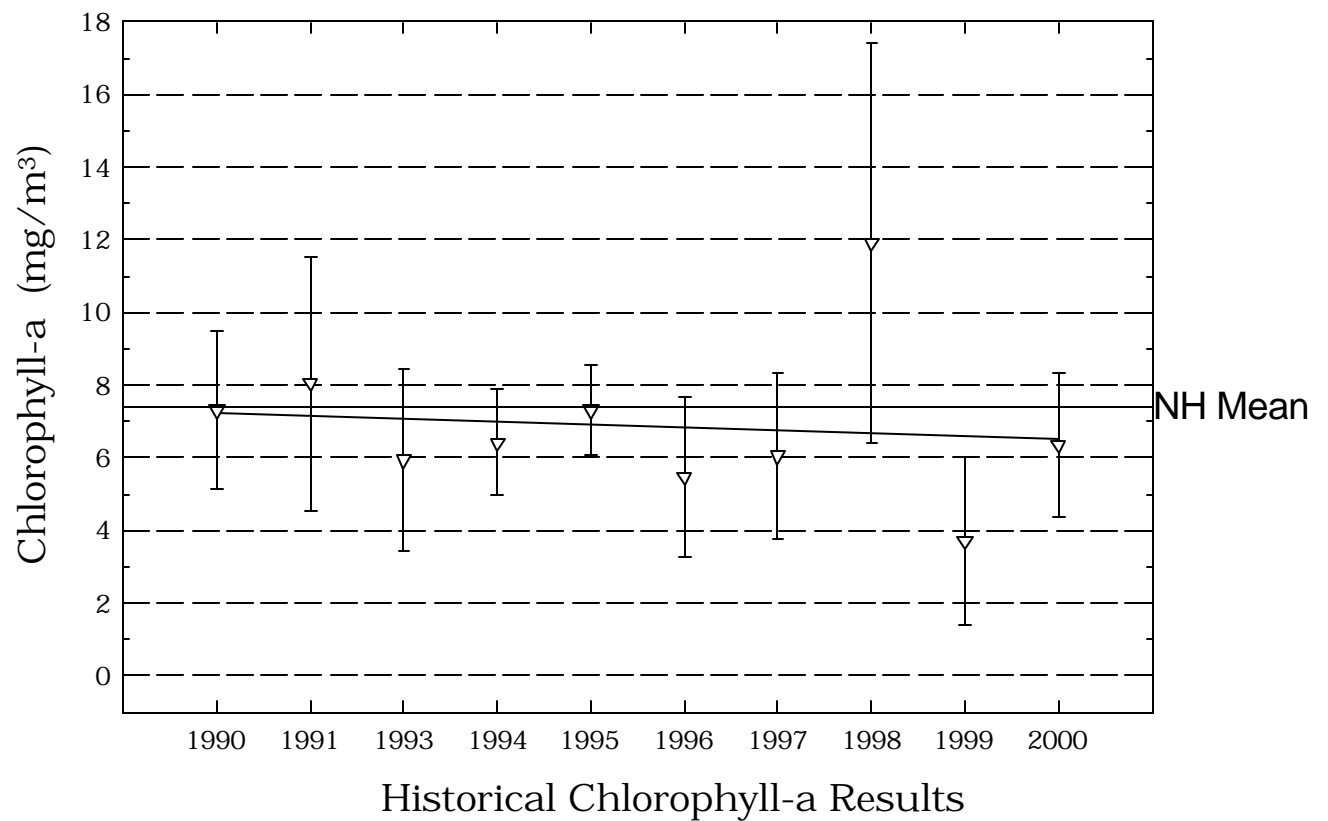
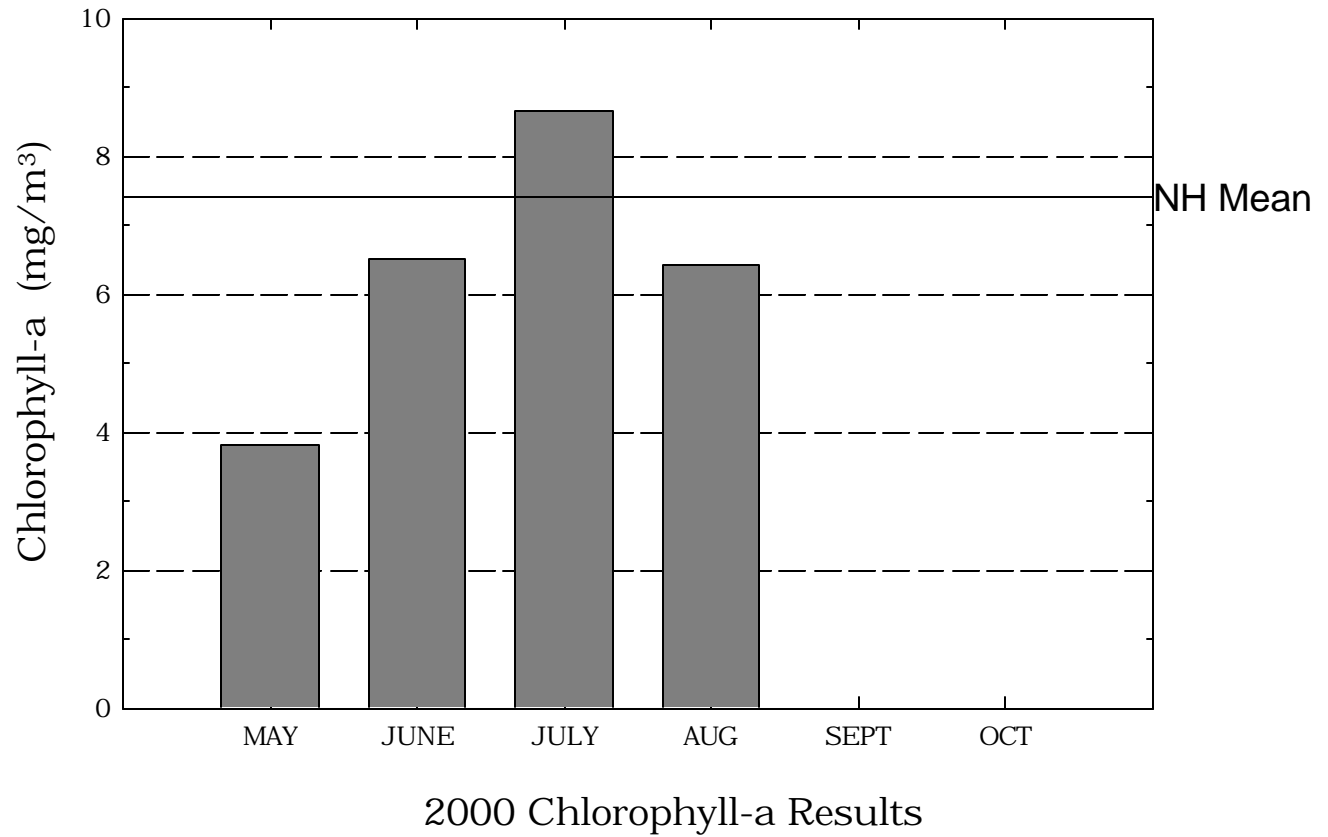
Septic Systems and Your Lake's Water Quality, WD-BB-11, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Lake Eutrophication, WD-BB-3, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Phosphorus in Lakes, WD-BB-20, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

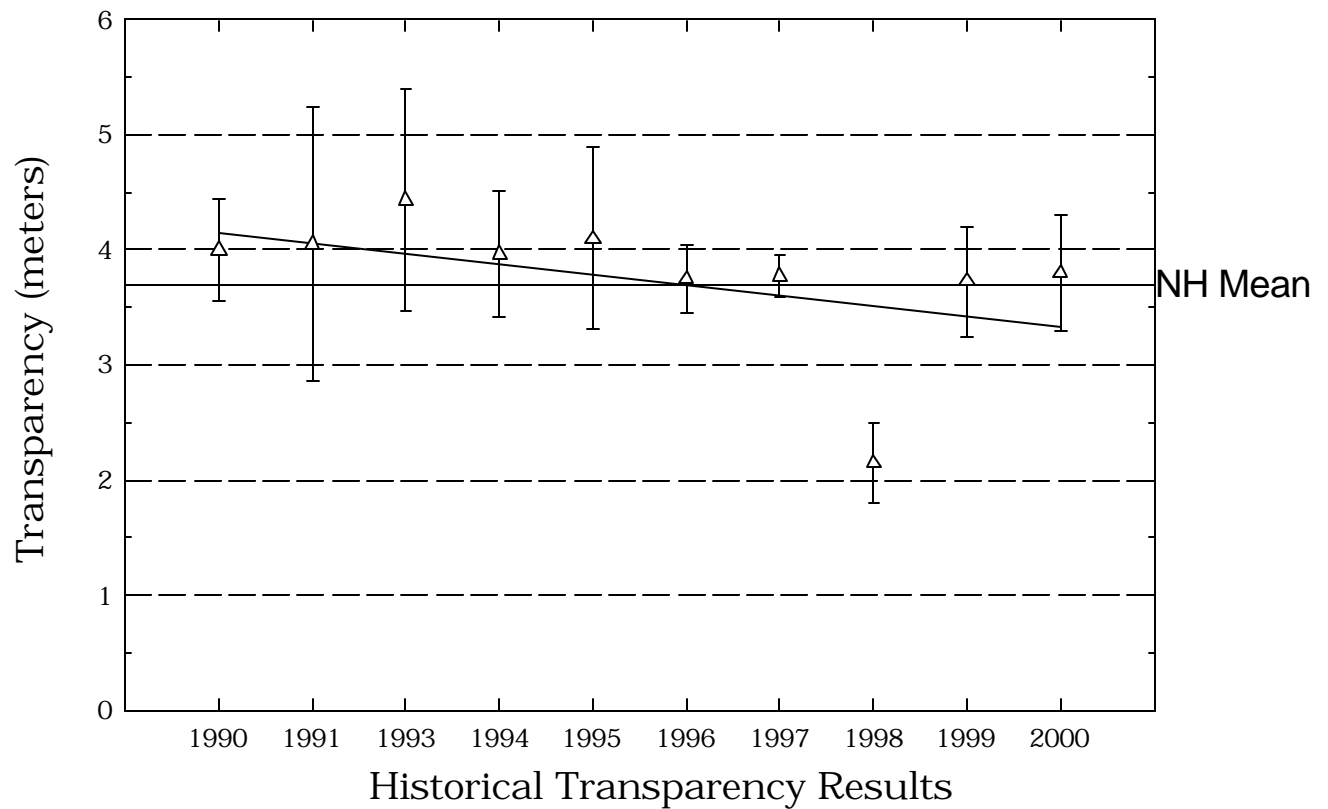
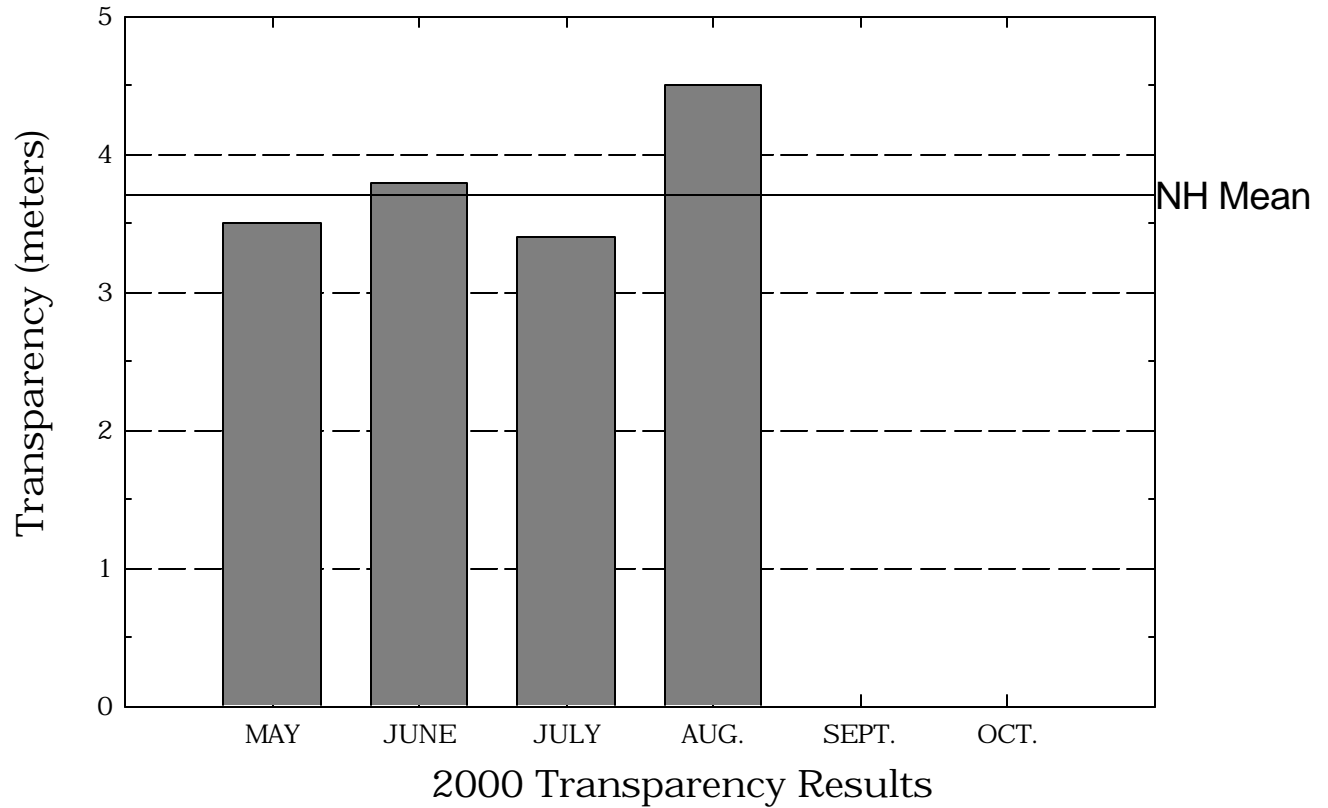
Beaver Lake

Figure 1. Monthly and Historical Chlorophyll-a Results



Beaver Lake

Figure 2. Monthly and Historical Transparency Results



Beaver Lake

Figure 3. Monthly and Historical Total Phosphorus Data.

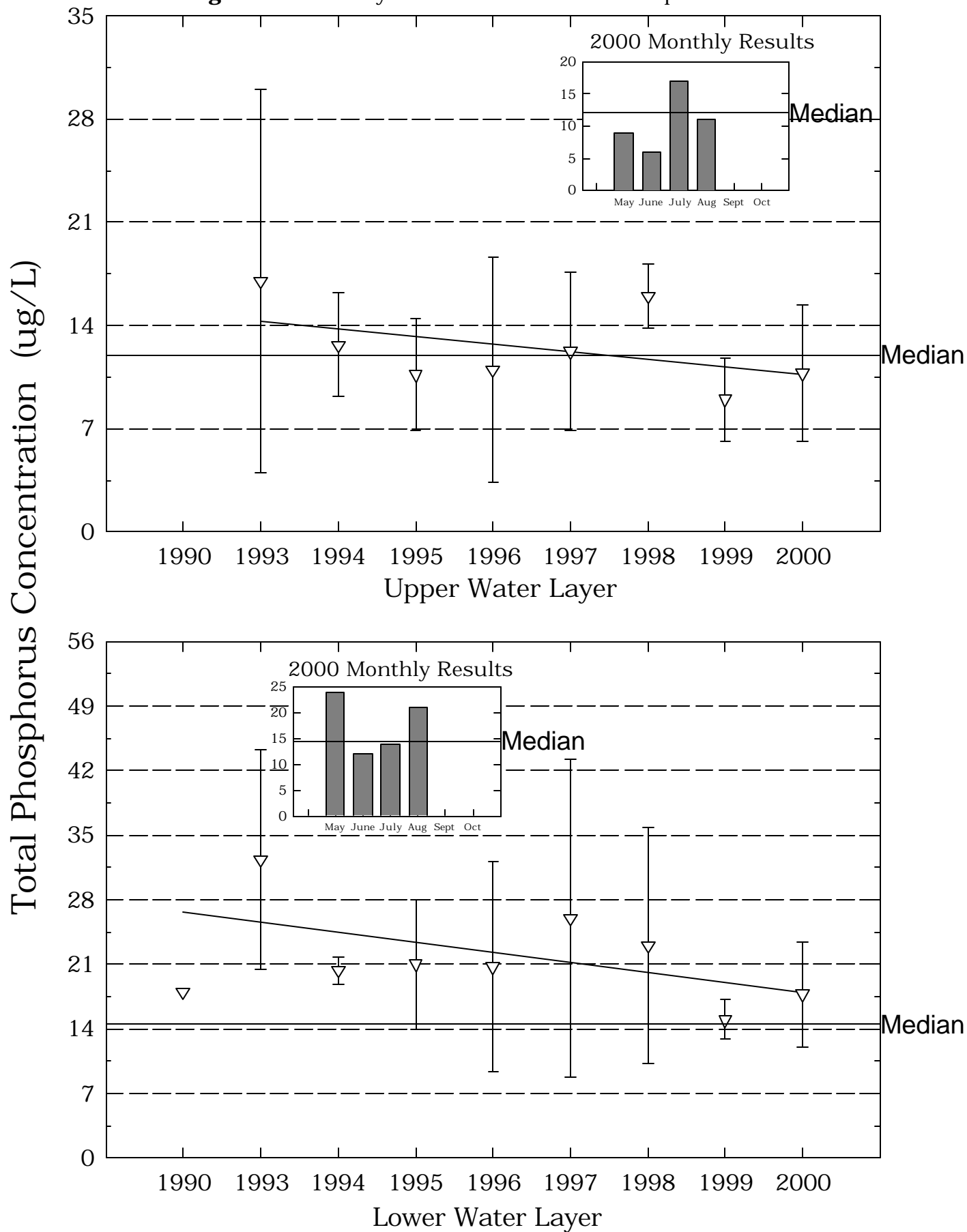


Table 1.**BEAVER LAKE****DERRY**

**Chlorophyll-a results (mg/m³) for current year and historical
sampling periods.**

Year	Minimum	Maximum	Mean
1990	3.82	10.28	7.32
1991	4.01	10.31	8.04
1993	4.45	8.82	5.94
1994	4.74	7.44	6.43
1995	5.99	8.39	7.32
1996	2.94	7.35	5.46
1997	4.27	9.36	6.05
1998	8.65	20.15	11.92
1999	0.81	6.26	3.71
2000	3.82	8.65	6.35

Table 2.

**BEAVER LAKE
DERRY**

**Phytoplankton species and relative percent abundance.
Summary for current and historical sampling seasons.**

Date of Sample	Species Observed	Relative % Abundance
05/10/1990	ASTERIONELLA	94
06/13/1990	TABELLARIA	64
	MALLAMONAS	9
07/13/1990	DINOBRYON	36
	CERATIUM	20
	TABELLARIA	15
08/10/1990	COELOSPHAERIUM	44
	OSCILLATORIA	14
	CERATIUM	13
09/07/1990	COELOSPHAERIUM	38
	OSCILLATORIA	22
	CERATIUM	20
10/05/1990	COELOSPHAERIUM	45
	ASTERIONELLA	13
	CERATIUM	13
05/22/1991	ASTERIONELLA	76
06/05/1991	TABELLARIA	39
	DINOBRYON	11
07/05/1991	CERATIUM	26
	COELOSPHAERIUM	14
	DINOBRYON	14
08/08/1991	CERATIUM	38
	SYNURA	24
	OSCILLATORIA	16
06/17/1993	TABELLARIA	24
	DINOBRYON	17
	CERATIUM	32

Table 2.**BEAVER LAKE****DERRY****Phytoplankton species and relative percent abundance.****Summary for current and historical sampling seasons.**

Date of Sample	Species Observed	Relative % Abundance
07/23/1993	CERATIUM	51
	DINOBYRON	31
07/18/1994	ANABAENA	82
09/08/1995	CERATIUM	34
	SYNURA	18
	DINOBYRON	13
07/22/1996	CERATIUM	79
	TABELLARIA	13
	ASTERIONELLA	3
08/31/1998	OSCILLATORIA	43
	RHIZOSOLENIA	29
	ANABAENA	7
08/23/1999	FRAGILARIA	21
	TABELLARIA	35
	ANABAENA	12
08/25/2000	CERATIUM	59
	SYNURA	17
	FRAGILARIA	7

Table 3.
BEAVER LAKE
DERRY

**Summary of current and historical Secchi Disk
transparency results (in meters).**

Year	Minimum	Maximum	Mean
1990	3.4	4.5	4.0
1991	2.6	5.5	4.0
1993	3.6	5.5	4.4
1994	3.4	4.5	3.9
1995	3.5	5.0	4.1
1996	3.5	4.1	3.7
1997	3.5	3.9	3.7
1998	1.8	2.5	2.1
1999	3.2	4.3	3.7
2000	3.4	4.5	3.8

Table 4.**BEAVER LAKE
DERRY**

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
CAT-O-BROOK	1993	7.12	7.12	7.12
	1994	6.76	6.90	6.82
	1995	6.66	7.18	6.85
	1996	6.71	6.86	6.77
	1997	6.84	7.18	6.96
	1998	6.83	7.15	6.97
	1999	6.90	6.98	6.94
	2000	6.99	7.21	7.07
EPILIMNION	1993	7.08	7.56	7.33
	1994	7.16	7.32	7.26
	1995	7.37	7.63	7.48
	1996	6.94	7.23	7.01
	1997	6.99	7.31	7.16
	1998	6.64	7.41	6.98
	1999	6.92	7.21	7.04
	2000	7.17	7.35	7.25
HYPOLIMNION	1990	7.00	7.00	7.00
	1993	6.47	7.18	6.68
	1994	6.60	6.72	6.64
	1995	6.58	6.79	6.66
	1996	6.28	6.55	6.38
	1997	6.54	6.80	6.70

Table 4.**BEAVER LAKE****DERRY****pH summary for current and historical sampling seasons.****Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
	1998	6.44	6.64	6.53
	1999	6.49	7.12	6.69
	2000	6.52	6.89	6.62
JENNY-DICKEY BROOK				
	1993	7.18	7.18	7.18
	1994	6.99	6.99	6.99
	1995	6.71	6.97	6.82
	1996	6.40	7.07	6.71
	1997	6.74	7.26	6.93
	1998	6.50	7.20	6.72
	1999	6.86	7.18	6.99
	2000	6.99	7.28	7.09
MANTER BROOK				
	1993	6.91	6.91	6.91
	1994	6.80	6.82	6.81
	1995	6.58	7.09	6.82
	1996	6.51	6.83	6.67
	1997	6.82	6.92	6.86
	1998	6.64	6.98	6.79
	1999	6.96	7.23	7.07
	2000	6.75	7.08	6.92
METALIMNION				
	1993	7.26	7.46	7.32
	1994	6.96	7.11	7.01
	1995	6.66	6.91	6.75

Table 4.

BEAVER LAKE

DERRY

pH summary for current and historical sampling seasons.

Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1996	6.33	6.48	6.42
	1997	6.52	7.22	6.79
	1998	6.28	7.25	6.52
	1999	6.59	7.08	6.78
	2000	6.55	6.83	6.71

Table 5.

BEAVER LAKE

DERRY

Summary of current and historical Acid Neutralizing Capacity.

Values expressed in mg/L as CaCO₃.

Epilimnetic Values

Year	Minimum	Maximum	Mean
1993	15.80	16.20	15.93
1994	14.20	16.70	15.50
1995	16.70	19.90	17.97
1996	15.50	18.80	17.00
1997	14.30	16.90	15.55
1998	13.30	18.60	15.88
1999	14.00	15.60	14.72
2000	14.60	18.50	16.40

Table 6.

**BEAVER LAKE
DERRY**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
CAT-O-BROOK	1993	353.0	353.0	353.0
	1994	269.0	285.0	276.8
	1995	192.0	197.0	194.5
	1996	234.0	297.9	270.6
	1997	198.0	252.0	223.7
	1998	163.7	274.5	223.6
	1999	193.5	336.1	275.4
	2000	219.0	308.0	265.0
EPILIMNION	1993	154.0	157.0	155.8
	1994	153.2	154.4	153.8
	1995	160.7	164.0	162.6
	1996	152.7	161.7	157.1
	1997	141.1	148.7	145.8
	1998	110.1	142.8	124.7
	1999	173.2	184.9	179.7
	2000	152.2	161.4	156.2
HYPOLIMNION	1990	301.0	301.0	301.0
	1993	143.6	154.9	147.5
	1994	149.7	163.3	155.2
	1995	154.0	172.8	163.8
	1996	150.4	159.3	155.9
	1997	144.2	153.0	148.9

Table 6.

**BEAVER LAKE
DERRY**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
	1998	147.8	166.5	156.9
	1999	174.2	186.7	179.7
	2000	146.1	158.4	152.6
JENNY-DICKEY BROOK				
	1993	247.0	247.0	247.0
	1994	263.0	263.0	263.0
	1995	194.4	344.0	269.2
	1996	230.5	303.2	258.5
	1997	217.0	265.0	241.0
	1998	166.1	281.2	223.6
	1999	270.0	294.0	282.0
	2000	237.0	269.0	251.0
MANTER BROOK				
	1993	135.8	135.8	135.8
	1994	134.5	174.5	151.4
	1995	131.5	145.9	137.1
	1996	131.8	149.7	141.7
	1997	116.2	152.2	131.1
	1998	113.8	148.2	126.9
	1999	164.8	255.0	196.0
	2000	139.9	162.2	154.8
METALIMNION				
	1993	147.7	155.0	152.4
	1994	147.0	155.1	151.6
	1995	152.0	169.5	161.1

Table 6.

**BEAVER LAKE
DERRY**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
	1996	152.6	197.7	165.1
	1997	142.6	152.7	148.1
	1998	104.4	141.1	125.1
	1999	173.7	184.7	179.3
	2000	149.6	157.4	153.6

Table 8.**BEAVER LAKE****DERRY**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
CAT-O-BROOK	1993	11	11	11
	1994	32	47	39
	1995	29	57	43
	1996	14	27	20
	1997	22	33	27
	1998	16	27	21
	1999	22	51	33
	2000	14	25	19
EPILIMNION	1993	9	32	17
	1994	9	16	12
	1995	8	15	10
	1996	3	21	11
	1997	5	18	12
	1998	13	18	16
	1999	1	13	7
	2000	6	17	10
HYPOLIMNION	1990	18	18	18
	1993	19	42	32
	1994	19	22	20
	1995	13	26	21
	1996	6	32	20
	1997	13	51	26

Table 8.**BEAVER LAKE****DERRY**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
	1998	10	34	23
	1999	13	25	17
	2000	12	24	17
JENNY-DICKEY BROOK				
	1993	15	15	15
	1994	45	45	45
	1995	30	43	36
	1996	20	38	26
	1997	21	36	28
	1998	35	36	35
	1999	50	53	51
	2000	25	31	27
MANTER BROOK				
	1993	12	12	12
	1994	25	34	28
	1995	21	47	33
	1996	5	23	16
	1997	18	32	25
	1998	17	27	21
	1999	15	46	27
	2000	13	19	17
METALIMNION				
	1993	9	28	21
	1994	14	19	16
	1995	14	30	22

Table 8.

BEAVER LAKE

DERRY

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
	1996	5	29	19
	1997	12	18	15
	1998	11	21	16
	1999	10	15	12
	2000	9	15	13
SIMONDS	1999	9	9	9

Table 9.
BEAVER LAKE
DERRY

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
August 25, 2000			
0.1	22.6	7.3	84.1
1.0	22.4	7.2	83.1
2.0	22.1	7.0	80.8
3.0	21.8	6.8	77.3
4.0	21.4	6.8	77.0
5.0	20.1	3.8	42.4
6.0	14.0	0.5	5.3

Table 10.**BEAVER LAKE****DERRY****Historic Hypolimnetic dissolved oxygen and temperature data.**

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 17, 1993	12.5	6.2	1.2	10.0
July 23, 1993	12.0	8.3	0.2	2.0
July 18, 1994	12.0	10.2	0.4	4.0
September 8, 1995	13.5	8.2	0.3	3.0
July 22, 1996	12.0	7.5	0.1	1.0
August 22, 1997	13.0	11.6	0.5	5.0
August 31, 1998	11.0	9.3	0.2	2.0
August 23, 1999	12.5	10.1	0.8	7.1
August 25, 2000	6.0	14.0	0.5	5.3

Table 11.

**BEAVER LAKE
DERRY**

**Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
CAT-O-BROOK	1997	1.2	4.3	3.0
	1998	0.7	1.7	1.1
	1999	1.6	7.4	4.2
	2000	1.2	2.7	2.0
EPILIMNION	1997	0.6	0.9	0.7
	1998	0.8	1.4	1.2
	1999	0.6	0.8	0.7
	2000	0.3	0.9	0.6
HYPOLIMNION	1997	0.9	3.3	2.1
	1998	1.1	4.6	2.4
	1999	0.8	5.0	2.0
	2000	1.0	2.4	1.5
JENNY-DICKEY BROOK	1997	0.7	5.2	2.9
	1998	0.8	2.5	1.6
	1999	1.1	1.2	1.2
	2000	0.8	1.2	0.9
MANter BROOK	1997	1.0	3.6	1.7
	1998	0.6	2.2	1.1
	1999	1.4	2.2	1.7
	2000	0.9	1.0	1.0

Table 11.

BEAVER LAKE

DERRY

**Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
METALIMNION	1997	0.7	1.3	0.9
	1998	0.7	4.0	1.7
	1999	0.5	1.0	0.8
	2000	0.5	2.5	1.0